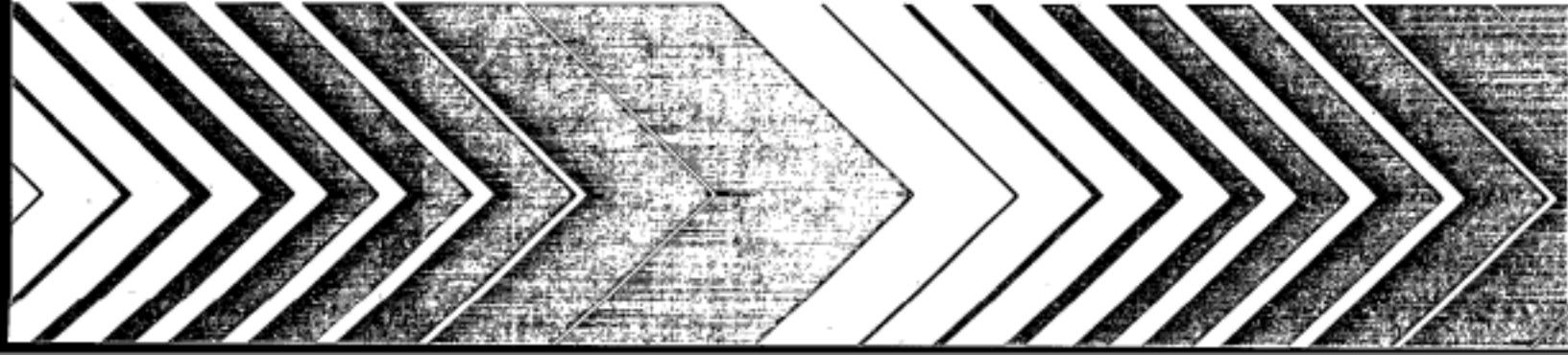




Fish Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters



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FISH FIELD AND LABORATORY METHODS FOR EVALUATING
THE BIOLOGICAL INTEGRITY OF SURFACE WATERS

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FOREWORD

Environmental measurements are required to determine the quality of ambient waters and the character of waste effluents. The Environmental Monitoring Systems Laboratory - Cincinnati (EMSL-Cincinnati) conducts research to:

- o Develop and evaluate methods to identify and measure the concentration of chemical pollutants in drinking waters, surface waters, groundwaters, wastewaters, sediments, sludges, and solid wastes.
- o Investigate and evaluate methods for the identification and measurement of viruses, bacteria and other microbiological organisms in aqueous samples and to determine the response of aquatic organisms to water quality.
- o Perform ecological assessments and measure the toxicity of pollutants to representative species of aquatic organisms and determine the effects of pollution on communities of indigenous freshwater, estuarine, and marine organisms, including the phytoplankton, zooplankton, periphyton, macrophyton, macroinvertebrates, and fish.
- o Develop and operate a quality assurance program to support the achievement of data quality objectives in measurements of pollutants in drinking water, surface water, groundwater, wastewater, sediment and solid waste.
- o Develop methods and models to detect and quantify responses in aquatic and terrestrial organisms exposed to environmental stressors and to correlate the exposure with effects on biochemical and biological indicators.

This manual describes guidelines and standardized procedures for the use of fish in evaluating the biological integrity of surface waters. It was developed to provide biomonitoring programs with fisheries methods for measuring the status and trends of environmental pollution on freshwater, estuarine, and marine habitats in field and laboratory studies. These fish studies are carried out to assess biological criteria for the recognized beneficial uses of water, to monitor surface water quality, and to evaluate the health of the aquatic environment.

Thomas A. Clark
Director
Environmental Monitoring Systems
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PREFACE

The Bioassessment and Ecotoxicology Branch, Ecological Monitoring Research Division, Environmental Monitoring Systems Laboratory - Cincinnati is responsible for the development, evaluation, and standardization of methods for the collection of biological field and laboratory data by EPA regional, enforcement, and research programs engaged in inland, estuarine, and marine water quality and permit compliance monitoring, and status and/or trends monitoring for the effects of impacts on aquatic organisms, including the phytoplankton, zooplankton, periphyton, macrophyton, macroinvertebrates, and fish. The program addresses methods for sample collection; sample preparation; organism identification and enumeration; the measurement of biomass and metabolic rates; the bioaccumulation and pathology of toxic substances; bioassay; biomarkers; the computerization, analysis, and interpretation of biological data; and ecological assessments.

This manual contains field and laboratory fish methods for evaluating the health and biological integrity of fresh, estuarine, and marine waters. The manual is a revision and enlargement of the chapter on fish methods originally published in the document, "Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents," Environmental Monitoring Series, USEPA, 1973, EPA-670/4-73-001, which were developed by the Bioassessment and Ecotoxicology Branch, Environmental Monitoring Systems Laboratory - Cincinnati, at the request of the Biological Advisory Committee to provide biomonitoring programs with methods for assessing point and nonpoint sources of impacts, status and trends in water quality monitoring.

ABSTRACT

This manual contains biocriteria and describes guidelines and standardized methods for using fish in evaluating the health and biological integrity of surface waters and for protecting the quality of water resources. Included are sections on quality assurance and quality control procedures; safety and health recommendations; fish collection techniques; specimen processing techniques; identification and taxonomic references; fish age, growth, and condition determinations; data recording; length-frequency; length-age conversion; annulus formulation; relative weight index; flesh tainting; fish kill investigation; bioassessment protocols for use in streams and rivers; family-level ichthyoplankton index; fish health and condition assessment; guidelines for fish sampling and tissue preparation for bioaccumulative contaminants; and an extensive bibliography for fisheries.

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